

Claims

1 5b
2 2.1
3 An information input processing, gesture-key mapping
4 computer system, the system comprising one or several
5 cameras, one or more memories with CPU connected to the
6 cameras, and processes running in the CPU that associates
gesture movements with typing and produce gesture
associated textual output.

1 5b
2 2.1
3 2. The gesture-key mapping system as in claim 1, where a
feedback is provided to the user on what kind of keys are
associated with the user's gestures.

1 3. The gesture-key mapping system as in claim 2, where
2 the feedback is provided using one or more of the
3 following: displaying keys on a display, playing sounds
4 labels for keys, displaying image indicators on a
5 display, playing special sound indicators, projecting the
6 keyboard to any surface, and displaying picture of the
7 keyboard with user's hands.

1 4. The system as in claim 1, where the gesture-key
2 processing is provided using the following modules:

3
4 a) a gesture capturing module that captures gestures
5 through camera sensors;

6
7 b) a gesture classifier module that classifies
8 gestures into classes of gesture movements;

9

c) an associator module for associating gesture classes or sequence of gesture classes with one or several most probable keys; and

d) an integrator module that integrate sequence of candidate of most probable keys into unique output key sequence.

5. The system as in claim 4, where the integrator module includes one or more of the following:

a) language module component that estimate probabilities of word strings corresponding to key candidate sequences;

b) character frequency module that estimate probabilities of character strings corresponding key candidate sequences;

c) confusable matrix that estimate how often correct gesture classes are confusable with another gesture classes;

d) gesture classes probability model that estimate probability of observing a string of gesture classes given a sequence of gesture frames;

e) computation of a probability of production a sequence of keys given a string of gesture frames;

f) generation of a lattice of sequences of keys given sequence of gesture frames;

25 g) finding the most probable sequence of keys from the
26 lattice of key candidate strings.

1 6. A system according to Claim 5, wherein each sequence
2 of keys receives a probability score, and the sequences
3 of keys that receive low scores are removed and are not
4 continuing when new candidates for keys arrive.

1 7. A system according to Claim 1, further comprising a
2 gesture correlator module to allow to adjust
3 automatically an invisible keyboard to hand positions.

1 ~~5/27~~ 8. The method for producing a textual output in which a
2 user makes typing like gestures without the presence of a
3 keyboard and the gestures are associated with the most
4 probable keys that would be typed if a keyboard were
5 presented.

1 ~~5/27~~ 9. A method according to Claim 8, wherein the probability
2 is computed using HMM.

1 ~~5/27~~ 10. A method of typing using a virtual keyboard,
2 comprising the steps:
3 making typing gestures without any real keyboard;
4 sensing the typing gestures; and
5 producing, from the sensed typing gestures, gesture
6 associated textual output.

1 ~~5/27~~ 11. A method according to Claim 10, wherein the typing
2 gestures are made by a person, and further comprising the
3 steps of providing feedback to the person on texture
4 output associated with the gestures.

12. A method according to Claim 11, wherein the step of providing feedback includes the step of displaying an image of typing keys associated with the gestures.

13. A method according to Claim 10, further comprising the step of generating an image of a keyboard; and wherein the step of making typing gestures includes the step of making typing gestures relative to said image as if said image were a real keyboard.

14. A method according to Claim 10, wherein the producing step includes the step of classifying gestures into classes of gesture movement.

15. A method according to Claim 14, wherein the producing step further includes the step of associating gesture classes with individual typing keys.

16. A method according to Claim 10, further comprising providing training data in words or sentences with certain timing data.

17. A typing system using a virtual keyboard, comprising means for sensing typing gestures made without any real keyboard; and means for producing, from the sensed typing gestures, gesture associated textual output.

18. A system according to Claim 17, wherein the typing gestures are made by a person, and further comprising

3 means for providing feedback to the person on texture
4 output associated with the gestures.

1 19. A system according to Claim 18, wherein the means for
2 providing feedback includes means for displaying an image
3 of typing keys associated with the gestures.

1 20. A system according to Claim 17, further comprising
2 means for generating an image of a keyboard; and wherein
3 the sensing means includes means for sensing typing
4 gestures made relative to said image as if said image
5 were a real keyboard.

1 21. A system according to Claim 17, wherein the producing
2 means includes means for classifying gestures into
3 classes of gesture movement.

1 22. A system according to Claim 21, wherein the producing
2 means further includes means for associating gesture
3 classes with individual typing keys.